Handwashing for Health: a focusing focus

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Numerous infective agents are spread by poor hand hygiene. Therefore, proper hand washing can prevent microbe dissemination. Nevertheless, hand-washing compliance is often limited, even among health workers. This is a public health concern particularly among children, which often display low immunity and poor hygiene habits. As children often show little interest in formal educational programs, many remain unaware of the hazard carried on their hands. Thus, we envisaged the present visual activity, using digital hand microscopes to show the dirt on the hands of students on TV monitors. The activity was carried out mainly in low-income areas. As kids realize their hands are not exactly clean, they hurry to a bathroom or sink to wash them. At this moment a health professional or, biomedical science student, demonstrate the proper hand hygiene procedure. Afterwards, many students return to the microscope operator asking to have their hands rechecked and after this microscopy activity, seeing makes believing, thus people of all ages become aware of risks of hand-borne infections and the relevance of hygiene measures.

Keywords: health promotion; hand hygiene; education; science popularization

1. Introduction

Pneumonia and diarrheal diseases are respectively the first and second leading causes of death among children under the age of five causing nearly two million annual deaths worldwide [1]. Simple measures such as safe drinking water and adequate sanitation and hygiene are able to prevent over two million child deaths from pneumonia and diarrhea [2].

Not only diarrhea and dysentery are readily prevented by hand washing [3, 4], but also pneumonia [5] as respiratory tract pathogens such as influenza virus [6] and SARS (Severe Acute Respiratory Syndrome) may be prevented by universal hand hygiene. Circa 607,000 lives may have been saved from diarrhea and pneumonia by hand washing with soap [7].

Although hand washing is well known in infection spread prevention its compliance is surprisingly low, even among health care personnel [8-10]. Therefore, techniques such as gaming [11] as well as innumerous educational campaigns [e.g. 6; 12-14] were developed in order to enhance hand-washing compliance. Educational programs can produce significant increase in compliance among Healthcare workers [15], but little progress has been achieved on the compliance of children on similar interventions. Children are not readily convinced that unseen hand-borne pathogens can cause disease and even kill. Therefore, the development of innovative educational tools is required to accomplish this role.

Images play pivotal roles in education activities including Population Health education [16], health care education [14] and even on medical education [e.g. 17, 18].

It was previously shown that virtual learning systems, are more motivating, according to the visual presence of virtual agents and their appearance [19]. The present activity was envisaged to shed new light on skin visualization, using magnified real time images.

2. Methods

Initially the activities were performed with a toy comprised of a webcam equipped with magnifying lens and light-emitting diodes termed “eyeclops” (EYECLOPS® Jakks Pacific Bionic Eye Magnifier) that magnifies objects by 200 x (Fig. 1A). Later we started using a mini handheld digital microscope Avantscope® apparatus (Celestron), equipped with a zooming and recording devices (Fig. 1B), both used to observe the hand skin and nails (C).
At first, we informally approached kids and adults in the health care units, schools or on the streets, during science or health fairs carried out by the FIOCRUZ (Oswaldo Cruz Foundation, Ministry of Health, Brazil) program “Science on the Road: education and citizenship” (www.bahia.fiocruz.br/ciencianaestrada), asking whether they had clean hands, (especially the ones eating). Many of them replied positively while staring at the hands, with the naked eye. Thus, we propose them to ‘take a look’ at their hands and nails through microscope lens. The magnified real-time moving image is displayed in a large TV set (Fig. 2). In the Amazonian traditional community at Humaitá AM we used a small TV using a diesel-run generator in a communal area or using the notebook batteries within housings (Fig. 2) as well as in Brazilian Northeast (Fig. 3). Many students and adults, upon realizing their hands are not clean at all, rush to have them washed, in the lavatory nearby, where they are waited for by healthcare professionals/graduate or well-trained undergraduate students that demonstrate the proper hand hygiene procedures.

3. Results and Discussion

The use of a largely unknown equipment or toy, connected to a large TV set generally draws the attention of many. When the public realizes they get the possibility to have their hands (freely) examined, it becomes an amusing and exciting activity, so long lines are rapidly formed. The instrument operator is often replaced for in public events the activity may take several hours. The students often exert a spontaneous multiplying effect, bringing colleagues and relatives to be examined. This fact may enhance the education spread-out among the kids. Before and after examinations, several students “hang on” with our team and even help indicating (Fig. 3) the dirt and dead skin deposits on the hands moving images.
Fig. 3  Hand observation in the Brazilian Northeast. Health sciences undergraduate students showing hand skin dirt to school students. Both during (A-C) and before/after examination (D, E) the students enjoyed the activity taking part repetitively. Many students exerted multiplicative effect inviting colleagues and relatives, as well as pointing dirt particles on the images (F). The activity attracted the attention not only of children and teenagers (A-F) but also of adults (G, H), which gladly took part in the activity and frequently taking pictures (B).

All of these enthusiastic demonstrations involve the waiting or bystanding people and their curiosity is clearly demonstrated by their expressions on the line. When they are examined they are totally excited, regardless the age or academic level (Figs. 3, 5) and as most people show dirty hands (eventually the microscope operator shows his own hands, also dirty, so he also goes wash them) and no one feels ashamed or humiliated, but realize that dirty hands is a widespread problem and the community may fight ensemble against it.

Fig. 4  Some visitors, often teachers, displayed rather clean hands (A), but others, were not quite similar (B-D). In Amazon, population usually presented vegetal (C) or sedimentary (D) deposits under nails.

Whereas some visitors show clean hands, many, mostly children, do not (Fig. 4). Amazon riverside community also displayed considerable remains of organic and mineral nature under the nails. Upper class professionals such as health educators and researchers working at FIOCRUZ, eventually got surprised and astounded to observe their own hands under the microscope (Fig. 5).

By realizing their hands are not exactly clean, many participants rush to the nearest sink or bathroom to have them washed. At this site we had part of our team, mostly undergraduate or graduate students well-trained in hygiene procedures, presenting proper hand-washing (Fig. 6).
During a Health Fair organized by a Church in Bahia a 6 yr-old girl asked to wash the hands of one of us (MAV-S, the senior researcher). Her little hands carefully washed those larger ones, with poor technique but outstanding dedication, demonstrating to the bystanders it is an important thing to be done. When one of the elder colleagues returned to have hands rechecked, our “little volunteer assistant” promptly informed us that the boy did not remove the rings before performing the hygiene technique, although was suggested to do so. Therefore, we asked him: “would you like to see whether your hands were clean even not taking off the rings for washing?” The boy removed the rings and immediately realized that the untanned area under them was quite dirty with large deposits of dead skin. He spontaneously rushed to wash his hands again. After such activities, the students and adults started believing the instructions they often received in campaigns and in home education.

Once during the National Science & Technology Week in Brazil a young student returned from the lavatory and asked for a rechecking, what was promptly done. His hand was quite clean and as usual he received compliments for a proper hand hygiene. Afterwards, he asked to have the other hand checked too. Confused we did as asked and it was evident that this one was completely dirty. So the kid said now he “believed” us for he washed both hands, but rubbed one on the floor. Therefore we complimented him enthusiastically (shake my hand! – not this one, for it is dirty!!!!).
At first the little boy though he would be scorned, but was complimented as a real scientist, for performing a *bona fide* experiment so was applauded by colleagues and teachers. Here a hands-on science might be said a “science on hands”. The old saying “seeing is believing” was unequivocally shown and exploited here in order to promote health. Besides hand hygiene, this kind of unexpensive microscopy is suitable for the observation of worms or insect larvae/pupae (Fig. 7), such as the ones of *Aedes aegypti*, mosquito vector of the potentially fatal dengue fever, highly endemic in many tropical countries. Thus a simple microscopy application, used in many different settings, may comprise a valuable tool in general public empowerment by education effective interventions.

Acknowledgements
Sponsored by: FAPESB, CNPq, PRONEX/MCT, PP-SUS, CAPES and INCT-INPeTAm/CNPq/MCT.

References


